Improving Decision-Making in Urban Stormwater Management – Strategy and stakeholder process

Amélioration de la prise de décision pour la gestion des eaux pluviales urbaines – Stratégie et processus de participation des acteurs

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RÉSUMÉ

Améliorer le processus décisionnel et la prise de mesures dans le domaine de la gestion du pluvial en zone urbaine est l'objectif principal du projet interdisciplinaire KURAS « concepts pour la gestion des eaux pluviales et d'assainissement en zone urbaine ». En réinstaurant un cycle hydrologique plus naturel c'est-à-dire en augmentant l'infiltration, évapotranspiration et la réutilisation des eaux de pluie au travers par ex. de toitures végétalisées, de noues ou d'étangs artificiels, une gestion adaptée de l'eau de pluie a le potentiel non seulement de réduire les inondations et la dégradation des rivières mais aussi d'améliorer la qualité de l'habitat et du paysage, le climat urbain et l'utilisation des ressources mais aussi de réduire les couts. Ces bénéfices multiples ont été évalués de façon systématique, une évaluation quantitative des bénéfices des stratégies de gestion du pluvial est maintenant possible et représente une vrai base pour supporter la prise de décision. La participation des parties prenantes est un élément clé de la prise de décision, elle permet de mettre à jour les intérêts, résoudre les conflits et discuter des barrières financières, légales, administratives et de connaissance liées à l'implémentation de stratégies adaptées de gestion du pluvial. Des stratégies adaptées ont été développées et évaluées pour deux quartiers caractéristiques de Berlin, Allemagne, dans le cadre du projet KURAS. Les acteurs principaux pour la gestion du pluvial ont collaboré avec les parties prenantes locales afin de formuler leurs attentes concernant les bénéfices attendus d'une nouvelle stratégie, de discuter des résultats et de l'évaluation des stratégies proposées mais aussi pour discuter d'une stratégie de transition. La présentation se concentrera sur le travail de participation des parties prenantes. Les résultats présentés sont traduits actuellement en recommandations adressées aux responsables politiques et professionnels du domaine.

ABSTRACT

Facilitating and improving decision-making in urban stormwater management is a key goal of the interdisciplinary research project "Concepts for urban rainwater management, drainage and sewage systems" (KURAS). By reinstating a more natural hydrological cycle, by increasing infiltration, evapotranspiration and stormwater reuse at the building or neighborhood level, e.g. via green roofs, pervious surfaces, swales and artificial ponds, to name but a few, stormwater management has the potential not only to reduce flooding and river degradation but also to improve landscape and habitat quality, the urban climate and resource efficiency, to reduce costs, and to respond more flexibly to uncertain future conditions. These multiple potential benefits have been valuated in a systematic way, thus providing a quantitative and comparative assessment of the effects of the various approaches to stormwater management as a basis for decision-making. An important element is the stakeholder involvement in planning in order to expose interests, resolve conflicts and to discuss existing financial, legal, administrative and knowledge-related barriers to adapted urban stormwater management. For two representative neighborhoods in Berlin, Germany, alternative and realistic stormwater management scenarios have been developed based upon an analysis of the current state and evaluated using the effect indicators. Central actors for stormwater management in Berlin are collaborating with other stakeholders in the sample neighborhoods to formulate and prioritize goals regarding the selection of measures, to discuss the evaluation results and to develop transition strategies. The presentation will focus on this experience of stakeholder participation in the design of stormwater management systems on the neighborhood scale. It will present preliminary findings to be translated into recommendations for policy makers and practitioners.

KEYWORDS

Climate change, decision-making, stakeholders, stormwater management, urban planning

1 INTRODUCTION AND AIM

For purposes of flood protection and the protection of human health and the environment, the safe disposal of wastewater and rainwater from impervious surfaces is indispensable in urban areas. To date, management concepts rely mainly upon the collection of wastewater and rainwater via combined or separate sewer networks and conveyance to a wastewater treatment plant or directly into a receiving water body. Undoubtedly, in Germany and elsewhere, conventional systems render invaluable services. However, particularly in the event of heavy rainfall, such systems can be overburdened, leading to local flooding, river degradation and other drawbacks. Thus, in addition to continued efforts to provide adequate stormwater storage space on a catchment level, a tentative transition to decentralised approaches of stormwater management can be observed. These more novel approaches to stormwater management aim to increase retention, infiltration and evapotranspiration at the building or neighborhood scale, e.g. via green roofs, pervious surfaces, swales and artificial ponds, to name but a few. By reinstating a more natural hydrological cycle, the latter approaches not only have the potential to prevent flooding and to protect surface waters. Further associated benefits include improvements to landscape and habitat quality, urban climate and resource efficiency (Montalto et al. 2007, Matsuoka and Kaplan 2008, Dreiseitl and Grau 2009, SenStadt 2011, US EPA 2011). A great potential for improving urban drainage seems to lie in combining approaches according to a particular setting.

As temperate regions experience increasing storm events as a result of climate change, improving urban drainage through close-to-source stormwater management may provide more flexibility to respond to uncertain future conditions. Yet numerous obstacles stand in the way of a widespread and effective implementation. Performance information which would allow a quantitative and comparative assessment of the multiple effects of the various measures is scattered or incomplete and not available as a basis for decision-making. Further investigations that examine in greater depth the effectiveness and associated risks of the various measures are needed to optimize the strategies and increase confidence. Many newer approaches to stormwater management affect not only drainage planning but building, open space and environmental planning was well, necessitating a far-reaching and often unprecedented integration of planning processes and of a broader range of stakeholders (Nickel et al. 2014). Finally, relevant policies, incentive systems and responsibilities require adjustment to enable the implementation of new approaches.

Facilitating decision-making, planning, policy-making and financing to improve stormwater management in the face of changing conditions are therefore central goals of the interdisciplinary, Berlin-based and three-year research project KURAS, “Concepts for urban rainwater management, drainage and sewage systems” (www.kuras-projekt.de). This contribution provides a general overview of the KURAS approach and places a particular focus on stakeholder involvement, an important element of the KURAS project with the aim of identifying and overcoming existing barriers to adapted urban stormwater management.

2 APPROACH AND METHODS

2.1 Characterization of management approaches

A key element of KURAS is an extensive characterisation of a broad selection of stormwater management options and a quantification of their multivarious effects as a basis for decision-making. The list of stormwater management options under analysis is extensive, covering three spatial scales (building, neighborhood and catchment) and including e.g. building greening, infiltration swales, pervious surfaces, stormwater reuse, retention ponds and extensions to the sewer networks.

Quantitative indicators have been developed to express non-monetary and monetary effects of the stormwater management options. The set of effects to be evaluated is likewise extensive, albeit not all-encompassing, including impacts on the environment (e.g. water or biodiversity), on residents (e.g. quality of open spaces, urban climate, building services) and on economic factors (e.g. costs, distribution of costs, resource consumption). Each effect is depicted by a small set of indicators, as described in Matzinger et al. (2014). Gaps in available date are being filled by undertaking additional experimental and monitoring programs. Data is collected in a joint database and will be made generally available upon completion of the project. More information on quantification of multiple benefits and cost of stormwater management is outlined in Matzinger et al. 2016 (also submitted for Novatech 2016).

2.2 Model areas and management strategies

To gain a better understanding of the actual potential to improve urban drainage, two representative model neighborhoods in the city of Berlin (each with a surface area of ~1 km²) provide the backdrop for developing tailored management strategies that combine approaches accross spatial scales relevant to KURAS. The model areas chosen represent the heterogeneity of the status quo with a view to the current technical systems in place (e.g. separate and combined sewer systems), the urban and natural environment which define the conditions enabling or prohibiting the implementation of specific management approaches (such as building typology, urban spacial structure and utilization, hydrogeological situation) and the issues and problems to be addressed (such as combined sewer overflow, urban heat, etc.). For these model areas, alternative and realistic stormwater management strategies have been developed. The developed management strategies are undergoing an extensive evaluation based upon the effects and their indicators and data basis described above, the consideration of local conditions to set effects to be expected and to check the feasibility of management measures implementation. To this aim, various modelling approaches and platforms are currently being employed to calculate and understand the accumulated effects that can be achieved by combining stormwater management measures to meet specific problems.

2.3 Stakeholder involvement

The implementation of new management approaches on various spatial scales, particularly the closer-to-source stormwater management strategies listed above, requires the acceptance and collaboration of those actors responsible for stormwater management today (in this case the water utility and city administration). It also necessitates the participation of or affects stakeholders hitherto not involved in the decision-making and planning process. The latter group includes “new” decision makers such as district administration offices responsible for urban spatial planning, road maintenance, environmental protection, and facility management, but also property owners, architects and urban developers. It also includes those stakeholders that might be affected in a positive or negative way, such as tenants. Finally, it includes institutions or persons responsible for public interests (environmental, social, etc.). These stakeholders each bring with them their own responsibilities, interests and experience. Understanding and balancing out the different perspectives is critical to identifying sustainable management strategies.

Cooperating with key stakeholders throughout the project duration is a central element of the KURAS project, whereby the intended stakeholder input is fourfold:

1) Data provision: Particularly the district administration offices, but also other stakeholders, manage data and possess knowledge specific to the model areas which is indispensable for developing realistic stormwater management strategies.

2) Prioritisation of goals: Co-initiators of the KURAS project and central actors for stormwater management in Berlin, including the Senate Department for Urban Development and the Environment and the city water utility Berliner Wasserbetriebe, collaborated with key district and other stakeholders in the model neighborhoods to formulate and prioritize goals as a basis for developing tailored management strategies. The prioritisation of goals was based upon a detailed description of specific problems in the model areas. Two approaches for achieving a common decision were employed and compared: moderated group discourse and an individual pairwise comparison of the possible benefits, which also enabled an aggregated total result, as described in Müller-Herbers (2007).

3) Identifying barriers: To understand why innovative stormwater management approaches are slow to spread, existing barriers to implementation (policy, financial instruments, etc.) and possible steps to overcoming these are being systematically identified. In Germany alone, the body of instruments, laws and technical regulations potentially relevent to stormwater management is so large as to seem unmanageable. It is further superimposed by numerous established urban and infrastructure planning practices on various spatial scales which may or may not be conducive to new management approaches. In KURAS, relevant and representative planning processes on different spatial scales undergo joint analysis by mixed stakeholder groups in a moderated workshop setting. The aim is to “dissect” established planning processes and, by doing so, to pinpoint the barriers critical in daily practice, incl. policy, conventions, and stakeholder interests, and to discuss alternatives.

4) Transition strategies: Finally, a discussion of the modelled outcomes (see 2.2 above) should

lead to improvements to the developed management strategies, but also to a better understanding of risks and benefits of alternative stormwater management approaches.

3 SELECTED RESULTS FROM STAKEHOLDER INVOLVEMENT

In this chapter we provide only a brief overview of selected results from the stakeholder involvement, which is an ongoing process.

3.1 Prioritisation of goals/desired benefits of stormwater management

The two approaches to prioritising goals for the model areas delivered comparable results. The group discourse, however, unearthed interesting perspectives regarding the specific choice of benefits of stormwater management that are addressed by the KURAS project.

- The involved stakeholders found it difficult to prioritize desired benefits before identifying and addressing existing barriers to alternative stormwater management measures which today prevent their implementation. The reality of administrative practice “hampered” this exercise.
- The stakeholders suspected conflicts of interest between the benefits addressed which could not be resolved on the abstract level of discussion.
- Benefits such as “improved biodiversity” and “improved urban climate”, to provide just one example, unfold their effects on different spatial scales and are therefore not conducive to a direct comparison or prioritisation. The stakeholders identified a more universal hierarchy of benefits, encompassing benefits for which policy goals are in place (water quality, biodiversity, resource efficiency), benefits which have a local impact (e.g. urban climate) and benefits that are very dependent upon the local building potential (e.g. quality of open space), which each need a different treatment in the planning process.

3.2 Identifying implementation barriers

Some barriers to implementation identified in discussion with stakeholders are specific to Germany and/or the city of Berlin and therefore not transferable to other countries or regions. This applies particularly to legal barriers and institutional arrangements. Other barriers appear to be of more common nature and therefore of interest to a wider public. Here we include the latter, focussing on a few core issues:

- **Knowledge/Capacity**: Involved stakeholders attest a widespread lack of knowledge on behalf of urban administrators and planners regarding alternative stormwater management practices and their potential benefits for urban improvement. The implementation of stormwater management practices on a building or neighbourhood level requires the integration of infrastructure and urban planning. There exists an apparent lack of integrated thinking in urban development, which can be attributed in part to deficits in education and vocational training, coupled with a lack of cooperation between administrative departments. Skill development, sensitisation for the subject and the establishment of networks are needed.
- “**Missing picture**”, lack of understanding of roles and responsibilities regarding stormwater management on the one hand and urban planning on the other. Process understanding is often incomplete, with many stakeholders aware of their own role but vague about the rest. The need for a “stormwater management guideline” was common agreement.
- **Clear and/or binding strategic objectives regarding stormwater management**: urban/ spatial planning is dependent upon strategic, overarching objectives, but does not define these objectives itself. Regarding stormwater management, such strategic objectives are uncommon to date. Possible approaches include: stronger restrictions regarding combined sewerage overflow or stormwater runoff.
- The **competition** for urban space is high, piting green against building space**.**
- **Cooperation with the private sector:** a central issue regards the distribution of costs and benefits, particularly when the private sector becomes involved. Who carries the costs and how incentives can be created for widespread implementation are still widely unanswered

questions. Similarly open is the question of service and maintanence of stormwater management measures on private property, both with respect to the effort and the skills required.

In ongoing collaboration with the KURAS stakeholder pool, strategies for dealing with these and other barriers are being developed.

4 CONCLUDING REMARKS AND OUTLOOK

Although the results presented here are broad and display all characteristics of work in progress, some preliminary and/or general remarks can be made.

1) The scope of options and measures available for wastewater and stormwater management is broad. KURAS postulates that by combining approaches according to the particular setting the greatest potentials can be released (no one-size-fits-all solution). The magnitude remains to be demonstrated, as does the compatibility between various types of approaches. The KURAS modeling results will inform this learning process. First results are provided in Matzinger et al. (2016).

2) Amongst relevant stakeholders, a common understanding exists of the need to improve stormwater management. Views regarding the best means of attaining this goal diverge significantly and often display bias, thereby confirming the goal of KURAS to improve the framework for decision-making and facilitate planning.

3) Alongside the valuation of potential benefits, a continued transparent and informed discussion regarding potential barriers to, but also risks of, various approaches to wastewater and stormwater management and means of abating these is indispensible to achieving a higher overall level of system sustainability, the central aim of the KURAS project.

The results of the KURAS projekt will include decision-support tools (software tools, information data base) and planning guidelines for various target groups (e.g. water utilities, planners and architects). Furthermore, recommendations will be made to adapt policy and financial instruments in support of sustainable management strategies for stormwater management. The presentation will focus on results from stakeholder participation in the KURAS project and in particular upon the analysis of established urban and infrastructure planning processes with the aim of identifying critical barriers and moving toward a more integrated planning.

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